

**CONFIRMED MINUTES**  
**IHRA SIDE IMPACT WORKING GROUP**  
**6<sup>th</sup> MEETING**  
**SAN DIEGO, CALIFORNIA**  
**03-04 NOVEMBER 1999**

**ATTENDEES**

Keith Seyer	(Chair)	Department of Transport & Regional Services, Australia
Craig Newland	(Secretary)	Department of Transport & Regional Services, Australia
Dainius Dalmotas		Transport Canada
Richard Lowne		EEVC
Joseph Kianianthra		National Highway Traffic Safety Administration, USA
Robert Hultman		AAM/OICA
Takahiko Uchimura		JAMA/OICA/JASIC
Koji Mizuno		Japanese Ministry of Transport
Risa Scherer		WorldSID Task Group
Haruo Ohmae		JARI

**APOLOGIES**

Apologies were received from Per Lovsund (EEVC) and Rainer Justen (ACEA).

**MODIFICATIONS TO AGENDA**

A report from the Japanese delegates on outcomes of discussion regarding their submission to the IHRA steering committee on the direction of various working groups was added as Item 3a.

Agenda Item 5 was amended to simply be a report on the activities of the IHRA Biomechanics Working group. This item is not for discussion.

It was noted that the circulated document to be discussed under Item 6 (Interrelationship of IHRA Side Impact and Biomechanics Working Groups and WorldSID Task Group) did not contain Attachments 1 and 2. Mr Newland to rectify this by circulating a corrected document. The text of the main document to be discussed at this meeting.

A representative from Monash University was unable to be present to clarify the Australian accident analysis data (Agenda Item 7). Mr Lowne offered to provide information generated from the CCIS database detailing the numbers of injuries to body regions for varying AIS severities. This was added to Agenda Item 7.

For Agenda Item 8 (Geometric studies of the fleet), Mr Hultman stated that he had some information, but that it was too much for a presentation. He offered to mail out CDs with this data.

Item 11 (Results from computer simulation to examine side impact compatibility) was deleted, as there was no information to be presented.

The revised agenda was accepted as amended. The modified agenda has Document Number SIWG 60.

## **MINUTES OF THE PREVIOUS MEETING**

The draft minutes of the fifth meeting, held in Sailuf, Germany were amended, approved and confirmed. Mr Newland to issue an updated version (refer Document SIWG 57).

## **JAPANESE SUBMISSION TO IHRA STEERING COMMITTEE**

Mr Uchimura explained that from the initial IHRA Side Impact meeting in Gothenburg, Sweden, the Japanese were under the impression that IHRA is a forum to discuss regulatory harmonisation. Subsequent discussions within the Side Impact Working Group had changed this view, with a new perception that IHRA was to focus on safety development and research, not regulation. However, there was still a belief among some personnel at JMoT that IHRA is for regulatory harmonisation. This prompted an expression of concern through a submission to the IHRA Steering Committee.

Mr Lowne, Mr Dalmotas, Mr Seyer and Mr Kianthra noted that this submission had been received by the IHRA Steering Committee, but had not been discussed. Mr Ohmae clarified the Japanese position. JMoT consider that IHRA is to conduct collaborative research to harmonise on test methods. Globally harmonised studies to support a harmonised test procedure will be supported by JMoT. They are interested in ground height, stiffness, dummy type, seating position etc for harmonisation of an MDB test. Therefore the Japanese are in agreement that IHRA should focus on safety development and research, which could lead to a harmonised test procedure.

Mr Seyer agreed to write to the IHRA Steering Committee to clarify this issue. Mr Ohmae was requested to email a written statement of the JMoT position (in English) to Mr Newland. This document has reference number SIWG 62.

## **RATE OF PROGRESS OF IHRA**

Mr Kianthra stated that NHTSA were concerned that IHRA was moving too slowly. Mr Lowne noted similar concern from the EEVC. Mr Seyer replied that the "brainstorming session" planned for Day 2 of this meeting was intended to identify deficiencies in knowledge and the priority research tasks to be conducted. Completion of this work would enable a test procedure to be finalised as quickly as possible.

## **WORLD SID TASK GROUP UPDATE**

Ms Scherer summarised the activities of the WorldSID Task Group.

Since the previous report to the IHRA Side Impact Working Group, the WorldSID Task Group has met in Barcelona and San Diego. A copy of the most recent status report was provided to the IHRA Side Impact Working Group. This document is referenced as SIWG 63.

Mr Moss made a proposal for anthropometry for the WorldSID to the IHRA Biomechanics Working Group in France. This proposal compared several databases – German, Japanese, US and Canadian and concluded that the UMTRI database would be appropriate. The IHRA Biomechanics Working Group agreed with this proposal. A paper is planned to be delivered at the SAE Congress in March 2000 to document the thought processes and decisions for the WorldSID anthropometry selection. Mass requirements for the dummy have not yet been finalised. The WorldSID Task Group has taken on the task of identifying appropriate masses for the WorldSID body parts.

Mr Kianianthra questioned why the anthropometry needed to be redefined. It was explained that there are well documented secular trends for an increase in height of the global population.

The IHRA Biomechanics Working Group also agreed to use the UMTRI anthropometry data for the small female and large male dummy sizes. A decision was taken to use the terms SMALL FEMALE, MID SIZED ADULT MALE and LARGE ADULT MALE as these would be better descriptors of a global population. The percentile descriptors are less accurate for diverse population groups.

The development of the WorldSID head and neck are well underway. A merger of two tenderers is now handling the shoulder/thorax/abdomen design concept.

The arms and upper legs require designs for attachments.

Thor-Lx lower legs are being investigated for suitability for inclusion in the WorldSID. Modifications are being considered.

Accelerometers for the WorldSID are in the evaluation and design phase.

Two 32 channel data acquisition units are intended to be mounted in the spine box of the WorldSID. One extra unit may be packaged in the pelvis if possible; the head was unable to accommodate a DA unit. A workshop to discuss requirements for the in-dummy DA system will be held in Detroit in December, with further workshops planned for Europe and Asia.

NHTSA and Transport Canada will conduct the biofidelity evaluation ( $\alpha$ -evaluation) of the WorldSID. Proposals for European testing are expected by February 2000.

Mr Kianianthra asked whether the WorldSID would be suitable for interaction with dynamic and static suppression systems for smart restraints.

Ms Scherer replied that some technologies would not be supported by the initial dummy design, but could probably be incorporated later, for example in the clothing for the dummy. It was pointed out that the specification for the dummy demanded a human-like pressure distribution on the seat.

## **REPORT FROM IHRA BIOMECHANICS WORKING GROUP**

Ms Scherer also reported on the activities of the IHRA Biomechanics Working Group.

The IHRA Biomechanics Working Group is considering side impact biofidelity requirements. Information has been provided by NHTSA, the EEVC and ISO (Technical Report 9790). Removing data derived from only one test has reduced the available data set. The data set has been further reduced by removing tests conducted using APR padding, as this material is no longer available and therefore cannot be used in a dummy evaluation program.

Side Impact injury risk curves are being compiled by Mr Cesari.

Mr Kianianthra asked if the scheduled timelines had slipped. Ms Scherer replied that the timelines had not been altered since the last report to the IHRA Side Impact Working Group. The WorldSID- $\alpha$  was scheduled for completion by September 2000. A launch of the dummy and a workshop demonstrating assembly, disassembly and some simple testing are scheduled for October 2000 in Australia.

Mr Seyer noted the likely need to consider injuries to non-struck side occupants. He acknowledged that the current WorldSID design concept incorporated a central spine (symmetric design) with instrumentation on one side, which could be configured for left or right hand impact.

Mr Lowne commented that the injury risk curves to be generated by the IHRA Biomechanics Working Group would be for humans and that Injury Assessment Reference Values (IARVs) could only be set for the dummy when the dummy was available.

### **COMMENTS REGARDING PAPER DESCRIBING INTERRELATIONSHIP OF VARIOUS GROUPS (EG IHRA SIWG, BWG AND WORLDSID TASK GROUP).**

Discussion of this paper resulted in an amendment to some of the wording. An amended version of this document to be circulated by Mr Newland. This document has reference number SIWG 64 Revision 2. Mr Newland will forward the paper to the IHRA Steering Committee for their information.

## **PRESENTATION OF ACCIDENT STUDIES**

### **EEVC**

Mr Lowne presented some data from the CCIS database from the UK. This information showed a breakdown by body parts of the number of injuries of varying AIS severities recorded during side impact crashes involving "Non-MPV" passenger vehicles. This table of data is referenced as document number SIWG 65.

Mr Lowne noted that head injuries due to contact inside the vehicle are not generally evaluated by an MDB test procedure. He suggested that a supplementary test could be used to evaluate the head injury risk from contact with

the vehicle interior. Such a test could be similar to the US FMVSS 201 headform test.

## **GEOMETRIC STUDIES OF THE FLEET**

### **AUSTRALIA**

Mr Seyer presented additional results for Australian vehicles of the height of various structural components above the ground (Document SIWG 20 Revision 2). Mr Newland was asked to add some additional information to the list to clarify the vehicle types and model years. A diagram of the measurements taken is to be included with this document. Mr Newland to revise this document and distribute to members.

### **JAPAN**

Mr Ohmae presented a document describing Japanese Vehicle Characteristics Investigations. The sample is made up of 113 car models from new motor vehicle registrations in 1998. The vehicle mass and front-end dimensions will be reported; a diagram of measurements to be taken was included in the submitted document. In addition, front-end stiffness (as determined by load cell barrier measurements) will be included. Information is currently being collected and will be presented at the next meeting.

### **OTHERS**

Mr Hultman commented that he had a large amount of data to share, but that it was too much to present at the meeting. He offered to distribute CDs containing the data to members. Mr Newland to supply Mr Hultman with a mailing list.

## **TEST RESULTS**

### **TRANSPORT CANADA**

Mr Dalmotas presented results from a series of MDB and vehicle to vehicle tests conducted by Transport Canada (Document SIWG 67). Most of the tests used SIDIIIs dummies in both the driver and struck side rear passenger positions, however some of the tests used a BioSID driver (in order to provide test results to complement the previous tests conducted under the bilateral arrangement with Australia). The Toyota Camry was chosen to be used as one of the target vehicles in this series as it is a very popular vehicle in both the US and Canada. In addition, it is a global car (available also in Japan, Australia and Europe) and has front seat side airbags in the US model.

Results from tests using Toyota Camry as a target vehicle show that the bullet vehicles in decreasing order of deformation and injury are Ford Explorer, TC Hybrid MDB, Toyota Camry and EEVC / FMVSS 214 MDB. The TC Hybrid barrier uses a perpendicular impact on a trolley with the same mass as the FMVSS 214 trolley. The TC Hybrid element is a custom element based on the EEVC (ECE R95) element, but widened to have the same width as the FMVSS 214 element.

It was also noted that when testing a 1999 BMW 3-series fitted with a SIDIIIs driver, that the dummy does not contact the inflatable tube (side airbag). The stature of the

SIDIIIs dummy and the kinematics cause the dummy's head to swing through an arc which passes underneath the tube.

#### JAPAN

Mr Ohmae provided a copy of the JMoT/JAMA/JARI test matrix for 1999/2000. This was included as part of document SIWG 66. It is planned to conduct both crabbed and perpendicular impacts using the EU and US barrier faces. A EuroSID-2 dummy is intended to be used in the driver seating position, with a SIDIIIs  $\beta$ + dummy in the struck side rear passenger seat for the crabbed tests. Consideration is being given to fitting a EuroSID-1 dummy in the front passenger position to evaluate injuries for a non-struck side occupant.

### **DEVELOPMENT OF A TEST MATRIX FOR IHRA SIDE IMPACT WORKING GROUP**

This item was introduced with a presentation from Mr Seyer. The content of the presentation was amended during the presentation to reflect views of the delegates. This was used as a "brainstorming session" to identify the issues to be resolved in order to be able to specify an IHRA side impact test procedure. Several of the tasks required to be undertaken were assigned to volunteers willing to conduct the necessary research. Mr Newland to distribute electronic copies of this presentation (Document number SIWG 68).

During the discussion on this item, Mr Kaniyanthra stated that any test procedure developed by IHRA would be applicable some time in the future for a future vehicle fleet. He noted that technologies such as dynamic suspension and structural modification (eg "blocker beams" to better engage the structure of a crash partner vehicle) may modify the fleet. He asked whether such issues could be considered when developing a test procedure.

The possible need for a test procedure to evaluate the injury risk for non-struck side occupants was also raised. The IHRA Side Impact Working Group has agreed to use the terms "struck side" and "non-struck side" instead of "near side" and "far side" when describing the location of occupants relative to the impact. Mr Dalmotas noted that it was probably impractical to test for occupant interaction in side impact tests due to difficulties with dummy kinematics, measurement and repeatability of results.

It was agreed that a re-evaluation of accident data would be required to address the issue of non-struck side occupant injury and quantify its significance.

Mr Lowne said that he had some data for head contact zones of non-struck side occupants. This data included front seat, rear seat, belted and unbelted occupants.

Mr Lowne apologised for not having the information available at the meeting, but agreed to provide this information to the group.

Mr Dalmotas was tasked with reviewing the global accident data to determine the injury distributions for non-struck side occupants.

It was noted that there might be a possible need to conduct full scale vehicle tests to examine the kinematics of a non-struck side occupant. The EEVC, NHTSA, AAM and JAMA delegates agreed to look for existing test data to address this issue. Mr Lowne commented that it may be possible to fit one extra rear dummy on the non-

struck side in an ECE R95 test. This information would be “free of extra cost” as it would not require an extra test. Australia and Transport Canada volunteered to conduct vehicle-to-vehicle and MDB-to-vehicle tests using non-struck side occupants.

The issue of the mass of the trolley for a mobile deformable barrier was discussed. Mr Kianianthra mentioned that the current average vehicle mass in the US is 3900lb. Mr Lowne said that the EEVC is considering ways to increase the severity of its side impact test; this consideration includes mass, ride height and speed. Japan expressed concern that a heavier trolley mass may be too high for very light Japanese vehicles. Mr Seyer reminded members that parametric studies to date had indicated that mass has little effect on injury outcome.

On the subject of the stiffness of the deformable barrier face of the MDB, Mr Lowne and Mr Hultman stated that a non-homogeneous barrier face gives a more realistic intrusion pattern and probably better represents the front-end characteristics of a real vehicle. Mr Kianianthra noted that reproducible and repeatable results are required and that a non-homogeneous barrier face meeting these requirements would be acceptable. He suggested that this may be complicated by the use of a crabbed MDB. Mr Seyer reiterated that stiffness, like mass, only appeared to have a second order effect on injury outcome.

The discussion then focussed on crabbing of the MDB. The EEVC view is that most side impact crashes occur at junctions with the struck vehicle travelling at low speed. In addition, MDB tests using both crabbed and perpendicular trolleys showed a higher severity for the ECE R95 test. The EEVC conclusion was that the crabbed test was more complicated, and offered no advantage over the perpendicular test.

NHTSA did not share this view, as statistics show that serious side impact injuries in the US occur in collisions with bullet and target vehicles moving at 30 and 15 miles per hour respectively, with impact angles between 60° and 90°. Mr Kianianthra explained that there are practical difficulties in testing with an impact angle of 60° and so 90° was chosen for the test procedure.

Transport Canada do not have any difficulty in conducting crabbed or perpendicular tests. TC has conducted tests with a Ford Taurus using both configurations, with identical results for the driver dummies (no rear dummies were fitted). In addition, results from MDB-to-vehicle and vehicle-to-vehicle tests using both perpendicular and crabbed configurations show identical injury severities and intrusion profiles. The FMVSS 214 test always produces higher loads on the rear dummy than a crabbed vehicle-to-vehicle test, indicating that the FMVSS 214 test is unrealistic for the rear dummy. Mr Dalmotas noted the corner problems on the FMVSS 214 barrier face and the lack of necessity to run tests in the crabbed mode.

Furthermore, he believes that it is not practical to conduct tests using a “realistic” (non-homogeneous) barrier face on a crabbed MDB.

Mr Mizuno stated that the JMoT view is that crabbing is more representative of two vehicles moving (as per the field data), however, Japan has a low frequency of occupants in the rear seat. If rear seat occupants are considered, a crabbed test is better as the perpendicular test produces a lower injury severity for a rear seat occupant than the crabbed test. The issues of MDB barrier construction and barrier

face need to be addressed. It is impractical to use the EEVC element on a crabbed trolley to load the rear occupant. The deformation pattern from a crabbed test is more representative of field data.

Mr Uchimura commented on behalf JAMA. A non-homogeneous barrier face better represents the fleet, but is more complicated to select. A simpler barrier face may be better and on this basis, a homogeneous barrier face would be suitable. JAMA has an open mind on the issue of homogeneous or non-homogeneous barrier faces. A crabbed test presents greater practical difficulty than a perpendicular test but may be more representative of the real world.

Mr Dalmotas commented that crabbing cars does not increase loads on the occupants; only crabbing MDB increases dummy loads, particularly on the rear dummy.

Mr Kianianthra stated that it is not necessary to crab the MDB to load the rear dummy. Mr Kianianthra committed to bring NHTSA analysis of field data for 2 and 4 door vehicles showing the effects of the FMVSS 214 regulation.

Mr Kianianthra stated that NHTSA have no agreement of commitment to undertake testing directly in support of IHRA. The NHTSA view is that if research from NHTSA's own agenda fits in with IHRA, NHTSA will provide these research results to IHRA. These comments initiated significant discussion within the group. Mr Seyer expressed his disappointment that, to date, NHTSA had been unable to develop a research workplan in support of IHRA side impact harmonisation activities.

Mr Kianianthra provided a commitment to discuss this issue within NHTSA with a view to conducting research directly aimed at helping IHRA.

Mr Kianianthra also agreed to present the NHTSA research plan, including relevance to the IHRA Side Impact Working Group at the next meeting.

There was some discussion regarding the appropriate height of the barrier above the ground. Mr Seyer began by saying that the recent Australian / Canadian parametric study on the effect of mass, stiffness and geometry indicated that raising the ground clearance of the barrier face had easily the greatest effect on injury outcome. Mr Lowne stated that 350mm would be a reasonable ground clearance as consideration is being given to increase the European regulation to this level.

It was suggested to use load cell barrier face data from vehicle tests to investigate the applicability of homogeneity and width of deformable barrier face/s.

Mr Lowne commented that the edges of a vehicle are generally weaker than the centre.

Mr Kianianthra offered to bring some data from US NCAP Full Frontal tests using the load cell wall.

NHTSA and Transport Canada agreed to investigate the issue of SUVs in side impact collisions. It was proposed that a crash test could be conducted in which a "Transport Canada special width" barrier face mounted 450mm above the ground could be used to impact a Ford Excursion or Explorer.

Regarding the issue of dummy sizes and seating position/s, NHTSA stated that they believe it is important to consider a family of dummies, however, the lack of availability of a side impact child dummy was noted. Mr Lowne commented that



rear occupants are generally children or elderly occupants, with a typically bimodal distribution. Therefore, a small rear dummy is probably more appropriate. He suggested a small female / adolescent.

The Japanese do not believe a rear dummy is required (as per comments at ESV 1996), however, they stated a willingness to listen to reasons why a rear dummy would be required and possibly change their view. They would also be prepared to listen to a rationale for the appropriate size for a rear dummy. Mr Ohmae agreed to analyse Japanese vehicle-to-vehicle side impact data to determine the proportion of females injured.

Mr Lowne pointed out the need to increase the speed of the MDB when all vehicles meet the current test at the current speed. Mr Dalmotas suggested that it would be better to keep the test speed at 50 km/h because there was likely to be an increase in the aggressivity of the MDB.

There was a discussion regarding the appropriate diameter of the pole to be used in a pole test (FMVSS 201 uses 254mm; ISO uses 350mm). Mr Lowne and Mr Hultman commented that the diameter should not affect the injury result very much, and that a larger diameter would probably offer the advantage of more repeatable results. Mr Lowne further noted that a side impact pole test assesses padding, not structure. A pole test speed of 30 km/h was selected.

For out-of-position testing, Mr Seyer to contact Adrian Lund from IIHS to request a presentation on the activities of the Side Airbag OOP Injury Technical Working Group.

Mr Kianianthra commented that NHTSA may conduct dynamic OOP tests. Mr Lowne then questioned whether the stiffness of the MDB face was likely to influence sensor algorithms and deployment characteristics. This was not discussed.

Mr Seyer also undertook to contact IIHS to present their vehicle-to-vehicle side impact parametric study looking at the effects of mass, stiffness and geometry on injury outcome. This information was presented at the 43<sup>rd</sup> Stapp Conference as paper number 99SC02.

## **OTHER BUSINESS**

Mr Dalmotas said that the TC/EEVC test matrix was still planned to go ahead. European certified vehicles would be tested using car-to-car tests. He noted that the Toyota Camry was a better choice as a bullet vehicle because the US and European variants of this vehicle have the same front structure, whereas the other candidate vehicle, Ford Mondeo (Euro variant) does not have the same front structure as the Ford Contour (US variant).

## **NEXT MEETING OF IHRA SIDE IMPACT WORKING GROUP**

It was agreed to hold the next meeting of the working group in conjunction with meetings of the IHRA Advanced Offset Frontal, Compatibility and Biomechanics Working Groups in Madrid, hosted by INSIA. The next Side Impact Working Group meeting is scheduled for 07-08 February 2000 in Madrid, Spain.

Further details regarding location of the venue and accommodation will be circulated when available.

**MEETING CLOSED.**

CRAIG NEWLAND  
03 March 2000